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Seasonal and Rotational Influences on Corn Nitrogen Requirements

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Seasonal and Rotational Influences on Corn Nitrogen Requirements

Abstract

This project was designed to study the N fertilization needs in continuous corn (CC) and corn rotated with soybean (SC) as influenced by location and climate. Multiple rates of fertilizer N were spring applied, with the intent to measure yield response to N within each rotation on a yearly basis for multiple years at multiple sites across Iowa. This will allow the determination of N requirements for each rotation, differences that exist between the two rotations, responses to applied N across different soils and climatic conditions, and evaluation of tools used to adjust N application.

Keywords

Agronomy

Disciplines

Agricultural Science | Agriculture | Agronomy and Crop Sciences

Seasonal and Rotational Influences on Corn Nitrogen Requirements

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Introduction

This project was designed to study the N fertilization needs in continuous corn (CC) and corn rotated with soybean (SC) as influenced by location and climate. Multiple rates of fertilizer N were spring applied, with the intent to measure yield response to N within each rotation on a yearly basis for multiple years at multiple sites across Iowa. This will allow the determination of N requirements for each rotation, differences that exist between the two rotations, responses to applied N across different soils and climatic conditions, and evaluation of tools used to adjust N application.

Materials and Methods

The first year of this research at the Northeast Research Farm was 2005. The study area was cropped to both soybean and corn in 2004. Therefore, in the initial year (2005) results were available for both rotations. The soils at this location are Readlyn-Floyd-Kenyon loams.

Tillage is fall chisel plowing and spring disk/field cultivation before planting. Rates of N applied to corn are 0 to 240 lb N/acre in 40 lb increments. Urea fertilizer is the N source and is broadcast and incorporated before planting. No N is applied with the planter. The farm superintendent chooses the corn hybrid and soybean variety. Pest control practices are those typical for the region and rotations. Corn and soybeans are harvested with a plot combine. Yields were corrected to standard moisture.

Results and Discussion

Yield levels were quite good in 2007 (Table 1), up to 225 bushels/acre with SC and 188 bushels/acre for CC. Calculated economic optimum N rates (EONR) in 2007 for the SC and CC rotations were 182 and 240 lb N/acre, respectively. These applied N requirements are higher than typically expected for corn in these rotations. Figure 1 shows the variation in corn yield and N response for the rotations across years. The EONR has been higher each year for CC compared with the SC rotation (2005–2007 average of 205 lb N/acre with CC and 167 lb N/acre with SC). The corresponding average yield for that time period for each rotation is 174 bushels/acre for CC and 195 bushels/acre for SC, with the corn yield in CC averaging 10.8% less than the SC. Yields have been lower each year with continuous corn. The average soybean yield in 2007 was 66 bushels/acre and was not influenced by previous year N rate applied to corn.

This study will continue and the best value will occur after the accumulation of multiple years of data. The results presented in this report are not meant to represent N recommendations. They do, however, represent responses for the specific years and rotations at this site.

Acknowledgements

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Table 1. Corn grain yield as influenced by N fertilization rate in 2007.

N Rate lb N/acre	SC ¹ ----- bu/acre -----	CC ¹
0	94	49
40	133	86
80	177	101
120	206	157
160	222	180
200	225	184
240	220	188

¹SC, corn following soybean; CC, corn following corn.

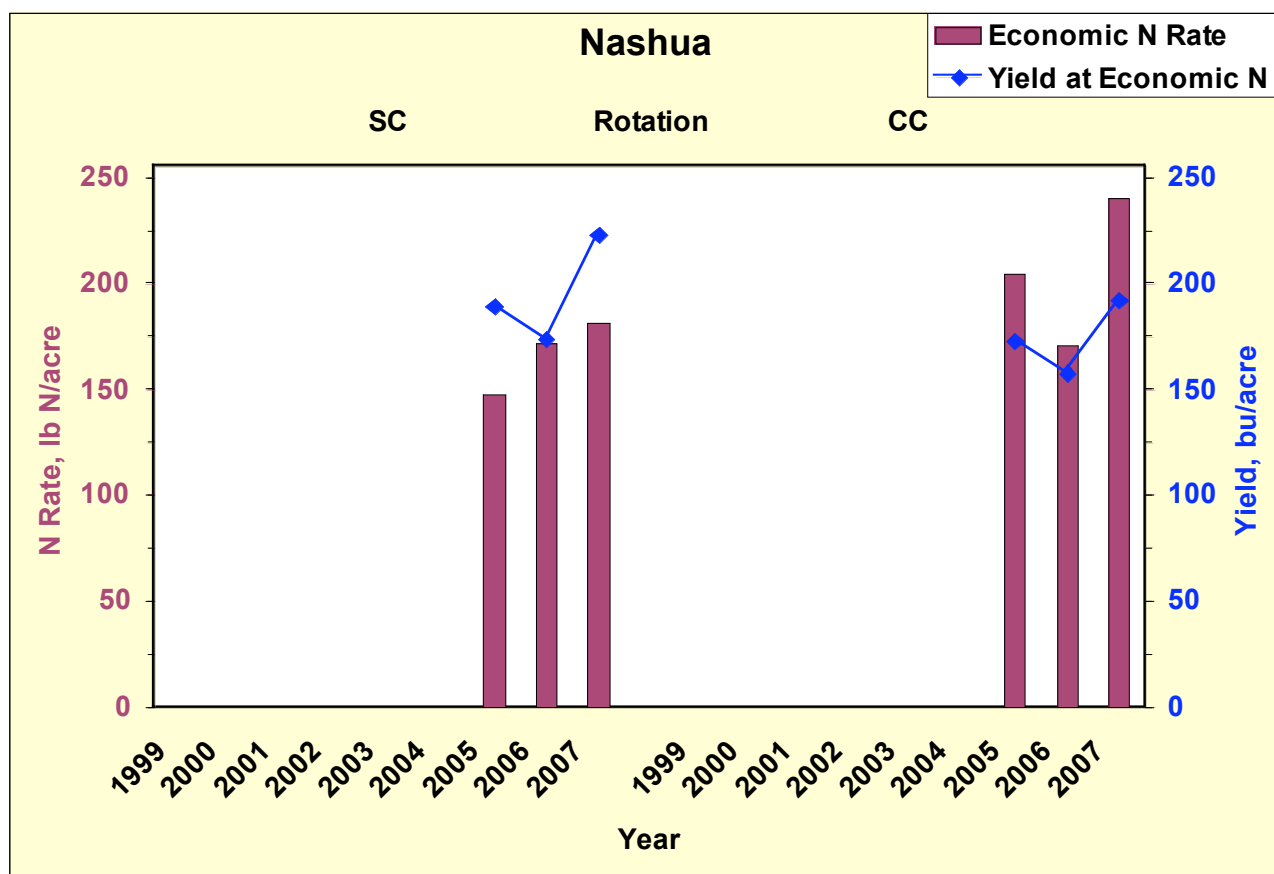


Figure 1. Economic optimum N rate (EONR) and corn yield at the EONR for each rotation and year, Northeast Research Farm, 2005–2007. The EONR was calculated at a 0.10 price ratio (\$/lb N:\$/bu corn grain).